

CLINICAL RESEARCH

CORONARY

The Impact of Extreme-Risk Cases on Hospitals' Risk-Adjusted Percutaneous Coronary Intervention Mortality Ratings



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ABSTRACT

OBJECTIVES The goal of this study was to examine the calibration of a validated risk-adjustment model in very high-risk percutaneous coronary intervention (PCI) cases and assess whether sites' case mix affects their performance ratings.

BACKGROUND There are concerns that treating PCI patients with particularly high-risk features such as cardiogenic shock or prior cardiac arrest may adversely impact hospital performance ratings. However, there is little investigation on the validity of these concerns.

METHODS We examined 624,286 PCI procedures from 1,168 sites that participated in the CathPCI Registry in 2010. Procedural risk was estimated using the recently published Version 4 National Cardiovascular Data Registry (NCDR) PCI risk-adjusted mortality (RAM) model. We calculated observed/expected mortality using several risk classification methods, and simulated hospital performance after combining their highest risk cases over 2 years into a single year.

RESULTS In 2010, crude in-hospital PCI mortality was 1.4%. The NCDR model was generally well calibrated among high risk, however there was slight overprediction of risk in extreme cases. Hospitals treating the highest overall expected risk PCI patients or those treating the top 20% of high-risk cases had lower (better) RAM ratings than centers treating lower-risk cases (1.25% vs. 1.51%). The observed/expected ratio for top-risk quintile versus low-risk quintile was 0.91 (0.87 to 0.96) versus 1.10 (1.03 to 1.17). Combining all the high-risk patients over a 2-year period into a single year also did not negatively impact the site's RAM ratings.

CONCLUSIONS Evaluation of a contemporary sample of PCI cases across the United States showed no evidence that treating high-risk PCI cases adversely affects hospital RAM rates. (J Am Coll Cardiol Intv 2015;8:10-6) © 2015 by the American College of Cardiology Foundation.

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Hospital quality is now judged by several metrics. A common measure for hospital outcomes is risk-adjusted mortality (RAM) (1,2), which is calculated for many different clinical conditions, including percutaneous coronary intervention (PCI). Historically, these risk-adjustment models have their basis in the belief that mortality, if appropriately adjusted for case mix, is a measure of overall hospital quality (3). Hospitals and providers have voiced concerns that risk-adjustment models employed to account for case mix may not adequately account for particularly high-risk clinical features (4,5), and that clinicians and hospitals treating a greater number of high-risk patients may have a worse rating (6). At worst, these concerns might lead clinicians to avoid very high-risk, but appropriate-to-treat, patients in order to protect their RAM ratings (7,8).

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PCI is a commonly performed procedure, occurring at approximately 1,700 medical centers in the United States (9). These centers have a wide variation in hospital volume and case mix (10), hence RAM ratings are a commonly used, though controversial, quality measure. Cardiac arrest and cardiogenic shock patients represent the highest-risk patients potentially treated by PCI. These 2 groups of patients have the highest in-hospital mortality, but may also have the highest potential benefit from urgent percutaneous revascularization (11-15). PCI practice patterns in the United States show significant variability for patients with cardiac arrest and cardiogenic shock, and recent data indicate that public reporting of performance measures may partially drive the differences seen in these practice patterns (16). A possible explanation for these data is that PCI practitioners may change their behavior (become more risk avoidant) to avoid a negative impact on their RAM ratings. There has been significant documentation of these concerns (17) and even observational evidence of shifts in PCI and surgical practice patterns (8,18).

Our study aimed to evaluate the accuracy of a validated and widely used risk adjustment model from the National Cardiovascular Data Registry (NCDR) CathPCI registry, the current NCDR PCI RAM model, to estimate mortality in moderate- and high-risk subsets. We then aimed to assess whether sites treating more high-risk cases have worse observed versus expected mortality ratios and worse RAM ratings than sites treating lower-risk patients.

METHODS

The CathPCI Registry is a collaborative effort of the American College of Cardiology Foundation and the Society for Cardiovascular Angiography and Interventions, and remains the largest ongoing registry of PCI in the United States. Descriptions of the registry have been previously published (9). The registry collects data on patient and hospital characteristics, clinical presentation, procedural characteristics, and in-hospital outcomes for PCI procedures from >1,200 sites across the United States. Data are entered into NCDR-certified software at participating institutions, and exported in a standard format to the American College of Cardiology. There is a comprehensive data quality program, including both data quality report specifications for

ABBREVIATIONS AND ACRONYMS

- CI** = confidence interval
- NCDR** = National Cardiovascular Data Registry
- O/E ratio** = observed versus expected mortality ratio
- PCI** = percutaneous coronary intervention
- RAM** = risk-adjusted mortality

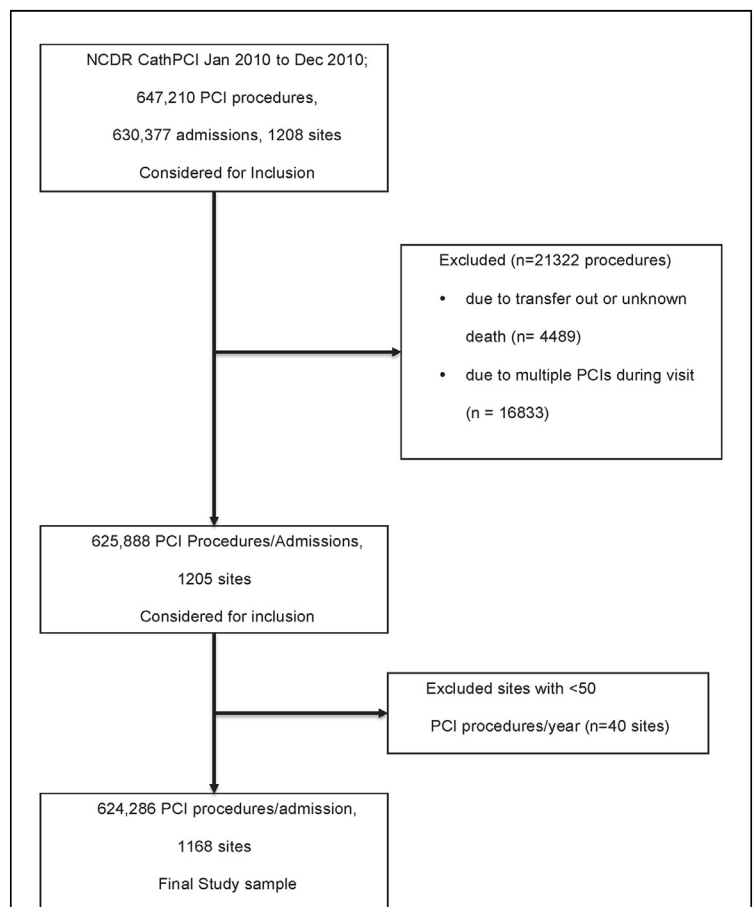


FIGURE 1 Study Sample Selection Diagram

The flow diagram shows the derivation of the study population. NCDR = National Cardiovascular Data Registry; PCI = percutaneous coronary intervention.

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